

Appendix A

TYPICAL COSTS ASSOCIATED WITH STRUCTURAL BMPS

The typical costs associated with each BMP type, along with maintenance issues and concerns and design guidelines and resources, are summarized in Table A-1. The references used to compile the information in the table are listed following the table. The superscripts following items in the table indicate the reference from which the information was obtained.

Table A-1. Typical Costs Associated with Structural BMPs

BMP Type	Installation or Construction Costs	Operation, Inspection, and Maintenance Costs	Maintenance Issues and Concerns	Design Guidelines and Resources
RETENTION SYSTEMS				
Dry Retention Basins	\$0.50-\$1.00 per cubic foot (cu. ft.) of storage. ¹³	<ul style="list-style-type: none"> Annually, 3-6% of initial construction costs¹³ 	<ul style="list-style-type: none"> Facility must be inspected every 6 months or after a major storm event and any debris must be removed. Control structure must be inspected and maintained semiannually and repaired as needed. Accumulated sediments must be removed at least once annually. Rotofilling or diskling the basin bottom should be done annually. Embankments and side slopes must be maintained. Use fertilizers only if absolutely necessary. 	Refer to Section SW BMP 3.07, in <i>The Florida Development Manual - A Guide to Sound Land and Water Management</i> . ⁴
Exfiltration Trenches	\$2.50-\$7.91 per cu. ft. of treatment volume. ^{12,13,16,20}	<ul style="list-style-type: none"> Costs are annually averaged to 3-20% of capital cost for buffer strip maintenance, trench inspection, and rehabilitation that is required every 5-15 years.^{9,11,13,20} Trench rehabilitation depends on site conditions and degree of clogging.¹⁶ 5% of initial construction costs.²¹ 	<ul style="list-style-type: none"> Trenches must be inspected regularly and debris removed, especially after large rain events. Periodic repair and sediment removal is needed to facilitate exfiltration. 	Refer to the <i>Management and Storage of Surface Water - Permit Information Manual, Vol. IV, Design Example of Exfiltration Trench</i> , ¹⁰ and Section SW BMP 3.03 in <i>The Florida Development Manual - A Guide to Sound Land and Water Management</i> . ⁴
Concrete Grid Pavers	\$0.50-\$2.00 per square foot (sq. ft.) of surface area. ^{21,12}	<ul style="list-style-type: none"> 5% of initial construction costs.²¹ 	<ul style="list-style-type: none"> Trash, grass clippings, and other debris should be removed from the surface of the area as needed. Pavers must be inspected regularly and debris removed, especially after large rain events. Nutrient and pesticide management should be performed as needed. 	Refer to Section SW BMP 3.01 in <i>The Florida Development Manual - A Guide to Sound Land and Water Management</i> . ⁴

Table A-1. Typical Costs Associated with Structural BMPs (Continued)

BMP Type	Installation or Construction Costs	Operation, Inspection, and Maintenance Costs	Maintenance Issues and Concerns	Design Guidelines and Resources
Vegetated Filter Strips	<p>\$0.00-\$1.30 per sq. ft.</p> <p>The lowest cost assumes that existing vegetation was used. The higher cost assumes sod was used.¹³</p>	<ul style="list-style-type: none"> • \$100-\$1,400 per acre annually. • The lower cost assumes that existing vegetation was used. • The higher cost assumes sod was used.¹² 	<ul style="list-style-type: none"> • Mowing must be performed as needed. • Aeration of filter strips is required. • Maintaining a healthy vegetation aids in removal efficiency and prevents erosion. • Sediment buildup must be removed annually to prevent a damming effect. • Nutrient and pesticide management should be performed as needed.^{12,19} • Periodic harvesting of some trees not directly adjacent to water bodies removes sequestered nutrients and maintains an efficient filter through vigorous vegetation. • To minimize soil compaction, vehicular traffic and excessive pedestrian traffic should be avoided. • Periodic repair and sediment removal is needed to prevent channelization. 	<p>Refer to Section SW BMP 1.61-1.85 and 3.04 in <i>The Florida Development Manual - A Guide to Sound Land and Water Management</i>.⁴</p>
Grassed Swales	<p>\$0.60-\$1.60 per sq. ft.^{11,19}</p>	<ul style="list-style-type: none"> • Annually 5-7% of initial construction costs.¹³ 	<ul style="list-style-type: none"> • The established width should be maintained to ensure the continued effectiveness and capacity of the system. • Grassed swales should be mowed to stimulate vegetative growth, control weeds, and maintain the capacity of the system. • Inspections, vegetation maintenance, mowing, and debris removal are required at least annually. • Inspect check dams for erosion at least annually. • Sediment removal, reseeding, or resodding should be done at least every 5 years.⁴ • Nutrient and pesticide management should be performed as needed. • Residents that have swales must be educated on their maintenance requirements. 	<p>Refer to Section SW BMP 3.04 in <i>The Florida Development Manual - A Guide to Sound Land and Water Management</i>.⁴</p> <p>General design criteria are also detailed in the <i>Stormwater Technology Fact Sheet, Vegetated Swales</i>.¹⁹</p>

Table A-1. Typical Costs Associated with Structural BMPs (Continued)

BMP Type	Installation or Construction Costs	Operation, Inspection, and Maintenance Costs	Maintenance Issues and Concerns	Design Guidelines and Resources
DETENTION SYSTEMS				
Dry Detention Ponds	\$0.50-\$1.00 per cu. ft. of storage. ¹³	• 1-5% of initial construction costs averaged annually. ^{12,13}	<ul style="list-style-type: none"> • Facility must be inspected every 6 months or after a major storm event and any debris must be removed. • Control structure must be inspected and maintained semiannually, and repaired as needed.¹³ • Accumulated sediments must be removed at least once annually. • Rototilling or disking the basin bottom should be done annually. • Embankments and side slopes must be maintained. • Use fertilizers only if absolutely necessary. 	Dry detention pond requirements are specified in <i>Management and Storage of Surface Waters - Permit Information Manual Volume IV</i> , ¹⁰ and USEPA, 1999e. ¹⁷ Also, refer to Section SW BMP 3.07 in <i>The Florida Development Manual - A Guide to Sound Land and Water Management</i> . ⁴
Wet Detention Ponds	Overall \$0.50-\$1.00 per cu. ft. of storage. ³ Costs depend on topography and soils. A natural area of depression and plant soils reduce costs.	• Annually 3-5% of initial construction costs ⁸ (includes grass mowing, debris and litter removal, inlet, outlet, embankment inspections, sediment removal, and disposal).	<ul style="list-style-type: none"> • Facility must be inspected every six months or after a major storm event and any debris must be removed. • Control structure must be inspected and maintained semiannually, and repaired as needed. • Accumulated sediments must be removed every five years. • Embankments and side slopes must be maintained and repaired as needed. • Use fertilizers only if absolutely necessary. 	Refer to <i>Management and Storage of Surface Waters - Permit Information Manual Volume IV</i> , ¹⁰ and Section SW BMP 3.02 in <i>The Florida Development Manual - A Guide to Sound Land and Water Management</i> . ⁴
Constructed Wetlands	\$0.05-\$1.00 per cu. ft. of storage. ^{13,18}	• Annually 1-5% of initial construction costs. ^{13,18}	<ul style="list-style-type: none"> • Slope control and removal of sediment in forebays. • Removal of trash, debris, and nuisance species. • Supplemental plantings. 	Isolated wetland requirements are specified in <i>Management and Storage of Surface Waters - Permit Information Manual Volume IV</i> . ¹⁰ General design criteria are detailed in the <i>Stormwater Technology Fact Sheet, Stormwater Wetlands</i> . ¹⁸

Table A-1. Typical Costs Associated with Structural BMPs (Continued)

BMP Type	Installation or Construction Costs	Operation, Inspection, and Maintenance Costs	Maintenance Issues and Concerns	Design Guidelines and Resources
OTHER SYSTEMS				
Water Quality Inlets	Capital costs range from \$1,100-\$3,000 per precast unit ¹² and \$600-\$900 for retrofitted unit ² .	<ul style="list-style-type: none"> • Hydrocarbon absorbents cost approximately \$100². • Maintenance of each unit costs \$7.50-\$90 per unit assuming the unit is cleaned out two times each year². 	<ul style="list-style-type: none"> • Proper disposal of trapped coarse-grained sediments and hydrocarbons is required. • Clean-out and disposal costs may be significant. • Maintenance requirements are high if clean out of sediment and debris is performed routinely. • Requires replacement of hydrocarbon absorbent at least once per year. 	Local design manuals and vendor catalogs for retrofit units and hydrocarbon absorbent ¹⁴ .
Separation Devices	Capital costs range from \$2,300-\$40,000 per precast unit. The size of the unit is based on site specific conditions. ¹⁵	<ul style="list-style-type: none"> • The cost of cleaning out separator systems varies depending on the type of separator used, normally less than \$1,000 per year.¹⁵ 	<ul style="list-style-type: none"> • Period inspections and sediment removal are required.¹⁵ • Proper disposal of trapped coarse-grained sediments is required. • Clean-out and disposal costs may be significant. • Maintenance requirements are high if clean out of sediment and debris is performed routinely. 	General design criteria are detailed in the <i>Stormwater Technology Fact Sheet, Hydrodynamic Separators</i> . ¹⁵
Chemical Treatment	For an alum stormwater treatment facility, with an average cost of \$245,000 per system serving a drainage area with an average size of 310 acres, the average cost is \$790 per acre treated. ⁵	<ul style="list-style-type: none"> • Average annual operation and maintenance cost is \$100 per acre of drainage area served.⁵ 	<ul style="list-style-type: none"> • Maintenance is high if chemicals are continually input and spent precipitate is removed. • Accumulated alum floc must be pumped out of the sump area on a periodic basis. • The accumulated floc is normally sent to a landfill, but some systems allow for automatic floc disposal into the sanitary sewer or adjacent drying beds.⁵ 	Not available

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